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INSECT LOSS SURVEY

BLACK'S MOUNTAIN EXPERIMENTAL FOREST

Season 1939

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TABLE OF CONTENTS

INTRODUCTION - 1

OBJECTIVES OF THE BUREAU PROGRAM - - - - - - - - - - - - - - - - 1

IMPRESSIONS OF THE SEASONAL LOSS - - - - - - - - - - - - - - - - 2
Season 1937 - 2
Season 1938 - 2
Season 1939 - 2

INSECT LOSS OCCURRENCE BY RISK GROUPS - - - - - - - - - - - - - 3

LOSS REDUCTION THROUGH SANITATION-SALVAGE CUTTING - - - - - - - 4

TENTATIVE CONCLUSIONS - 5

SUMMARY - 5

PLANS FOR 1940 - 6

REFERENCES CITED - 6

INSECT LOSS SURVEY

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INTRODUCTION

A portion of each season's work by the U. S. Bureau of Entomology and Plant Quarantine in cooperation with the California Forest and Range Experiment Station on the Black's Mountain Experimental Forest is to make a complete insect loss cruise on the sixteen timbered sections in the experimental area. This insect loss survey is made during the spring months of each year so that all trees in the preceeding years loss can be "spotted" by using foliage color. During the fall months, an additional cruise is made on enough of the area to determine the trend of the current insect infestation. In general, this fall cruise covers all compartments that have been treated in the sanitation-salvage cutting operation and in addition samples areas where data can be obtained relating to the occurrence of insect loss by risk groups. As a result of these periodic surveys it is possible not only to present a picture of current loss conditions on the Experimental Forest but also to carry forward, in the form of progress reports, the results being obtained on the following two objectives of the Bureau of Entomology and Plant Quarantine in the experimental program at Black's Mountain.

OBJECTIVES OF THE BUREAU PROGRAM

1. Can high risk trees be detected in the green stand with a high degree of accuracy?

2. Will the removal of high risk trees in a sanitation-salvage cut materially reduce subsequent loss resulting from endemic infestations?

First, by recording the degree of risk of infested trees on areas where risk ratings have previously been applied to all trees it is possible to segregate the loss occurrence by risk groups and determine the degree of accuracy obtained in detecting high risk trees in an undisturbed green stand.

Secondly, by comparing the loss records on compartments where all high risk trees have been removed in the sanitation-salvage cutting program with undisturbed areas set aside for check plots, it is possible to determine the degree of loss reduction that has resulted from the removal of high risk trees in the selective logging procedure.

IMPRESSIONS OF THE SEASONAL LOSS

As pointed out in previous progress reports, the Black's Mountain Experiment deals primarily with ponderosa and Jeffrey pine. For this reason, the following discussion of the seasonal loss conditions will be limited to these two pine species. However, since losses in white fir and incense cedar are recorded during the course of the surveys, these records will be included in the tables.

Various conditions noted during the past season indicate an increase in insect activity. To clearly picture conditions pointing toward this upswing in loss trends it is necessary to discuss the seasonal insect activity in detail. It seems advisable to start the discussion with the 1937 loss record.

1. During 1937 the infestation was found to be endemic with infested trees occurring as single individuals well scattered over the area. Practically all of the seasonal loss occurred in the over-mature decadent tree types, averaging 68 board feet per acre.

2. For the most part, loss conditions during 1938 were quite similar to those of 1937. By number of trees, 81 percent of the infested material occurred as single individuals in the decadent tree types. It seems significant that the remainder of the infestation occurred in small two or three tree groups. This type of small group killing presents the first indication of an increase in the beetle activity regardless of the fact that the total seasonal loss on the area was slightly below the 1937 record, averaging 65 board feet per acre.

3. The 1939 infestation was sampled during October by a cruise of 1950 acres, 24 percent of the remaining uncut area. This cruise indicates that the total 1939 loss over the entire area will approximate 145 board feet per acre, an increase of 123 percent over the 1938 loss. A good portion of this current loss was made up solely of high risk tree types but a noticeable feature in the infestation was that the attraction of beetles to these high risk trees was more than enough to completely fill the phloem area and as a result, the surplus population readily attacked nearby more vigorous tree types. This type of attack brought about a portion of the larger and more frequent group kills noticeable throughout the area.

An additional menace to the green stand resulted from a "flare-up" of engraver beetles attacking the tops of many thrifty-mature trees. The reasons for this increase of top-killing Ips species is not known. However, it was noted that as a result of this top-killing activity, western pine beetle broods readily attacked the remaining green portions of the top-killed trees. It is to be expected that, providing adverse factors do not materially reduce bark beetle broods, there will be a continued increase in insect loss during 1940.

If barkbeetle activity is of a cyclic nature, the 1937 infestation can be used to represent the low point in the infestation trend. The more aggressive type of attack which started during 1938 was indicative of a rising trend and a continuation of this aggressive activity resulted in an increase of the current infestation. A comparison of the past three season's loss is shown in table 1. From an examination of this table it will be noted that the current increase in loss is general over the entire area with the single exception of areas bordering sage flats. (Block A)

INSECT LOSS OCCURRENCE BY RISK GROUPS

The accuracy of detecting high risk trees in a green stand is secured by applying risk ratings (1) to individual trees and following the subsequent insect caused losses on undisturbed areas. The mortality ratio of loss occurrence within the risk groups is indicative of the accuracy obtained in picking out high risk trees.

Risk was first applied to portions of the Experimental Forest in 1937. During 1938 and 1939 all trees on additional acreage set aside for experimental plots were marked. To date there are 21,813 trees on 1,163 acres of check plots which have been given risk ratings. The losses that have occurred on these areas since they were marked are for periods of time extending up to 26 months. In order to show the accuracy obtained in detecting high risk trees in a green stand for a varying number of years, loss records have been segregated into one and two year periods following the marking procedure. The distribution of the insect loss within the risk groups is shown in table 2.

Table 2

Distribution of Insect Loss by Risk Groups

	Low Risk			High Risk		
Acreage in Sample	No. of Trees	B.M. Volume	Vol. per/A	No. of Trees	B.M. Volume	Vol. per/A
		One Year Period				
925.2	16	12,082	13	73	93,599	101
		Two Year Period				
615.9	14	15,995	26	84	112,770	183

Of the total number of trees marked, 19,480 were rated as being low risk (risk groups 1 and 2) and 2,333 were judged to be high risk (risk groups 3 and 4). Since marking, 128 trees, a total of 158,748 BM, have died. 106 of these dead trees had previously been rated as high risk. By number, 83% of the loss has occurred in 12% of the stand. This shows that

a preponderance of the insect loss has occurred in trees previously placed in the high risk groups. A comparison of the loss occurrence by yearly periods is shown in table 3.

Table 3

Comparison of Insect Loss by Risk Groups

	One Year Period			Two Year Period		
	Low Risk (% total)	High Risk (% total)	Ratio High/Low	Low Risk (% total)	High Risk (% total)	Ratio High/Low
Tree Basis	.32	9.22	29 times	.41	14.81	36 times
Volume Basis	.25	9.47	38 times	.48	15.03	31 times

The above table indicates that over a two year period, high risk trees can be detected from a green stand with a fairly high degree of accuracy. The next objective is to determine if the removal of these high risk trees in selective logging procedure will bring about a substantial reduction in insect caused loss on the treated areas.

LOSS REDUCTION THROUGH SANITATION-SALVAGE CUTTING

Logging operations for the removal of high risk trees was begun during 1937 and continued during the seasons of 1938 and 1939. Subsequent insect losses have been followed on all of the treated areas and it is now possible to compare the losses for one and two year periods with comparable undisturbed check areas. Insect losses for a two year period are now available on the acreage treated during 1937. Loss reduction for a single year can be obtained from an additional 666 acres treated during 1938, a total of 909 acres. The loss reduction as a result of the sanitation-salvage cutting is shown in table 4.

Table 4

Loss Reduction Through Sanitation-Salvage Cutting

Area	Acreage in Sample	Insect Loss No. Trees	Insect Loss Volume B.M.	Insect Loss Volume Acre	% of Stand Trees	% of Stand Volume	Loss Reduction (% Stand Weighted) Trees	Loss Reduction (% Stand Weighted) Volume
			One Year Period					
Untreated	1172.6	96	143,441	122	1.42	1.34	81.4	90.3
Treated	909.1	14	9,791	11	.27	.25		
			Two Year Period					
Untreated	385.9	52	77,691	201	.79	1.32	73.4	86.4
Treated	318.5	13	8,698	27	.21	.18		

The above table shows that for a year period there is a differential of 111 board feet per acre between treated and untreated areas. For a two year period this differential amounts to 174 BM per acre. This indicates that on every acre treated in the seasonal sanitation-salvage cutting program there is a saving of 111 BM per acre. By accumulating this loss differential over a period of years and applying the figure to the remaining uncut area, it can be seen that there is an enormous amount of timber to be saved by applying this light type of cut.

TENTATIVE CONCLUSIONS

The results being obtained at Black's Mountain are for a relatively short period and should not be used to indicate final conclusions. It is necessary that records be continued over longer periods of time to prove or disprove if the objectives of the program can be secured by the methods being used. These reports are prepared to show progress of the work to date and may or may not indicate the final results to be obtained at the conclusion of the program. It is encouraging however, that despite the current increase in insect activity, risk ratings have remained valid and loss reduction through sanitation-salvage treatment continues to show considerable promise.

SUMMARY

The intensive insect loss cruise of 16 timbered sections on the Black's Mountain Experimental Forest is a portion of each season's work on the experimental program being tested at Black's Mountain. This cruise is made during the spring of each year in order that the total loss of the preceding year can be recorded. The 1938 loss was cruised during the spring of 1939. A cruise on a portion of the area during the fall of 1939 was made to determine the current infestation trends. In addition to a determination of the total seasonal loss, each loss survey accumulates data on the occurrence of insect loss within each risk group and the effectiveness of the sanitation-salvage cutting as a means of reducing insect activity. These points may be summarized as follows:

1. The 1937 and 1938 infestations were found to be in an endemic state with losses averaging 68 and 65 board feet per acre respectively. During 1938 there was a tendency of infested trees to occur in small two and three tree groups. This type of grouping is believed to indicate the start of an upswing in loss trends.

2. From a sample of the 1939 infestation by a cruise of 24% of the area, it is estimated that the 1939 loss will show approximately 120% increase over 1938. The continuation and increase of group killing is apparently an indication of a continuing increase in insect activity.

3. From the death of 128 trees on 1163 acres of check plots where risk ratings had previously been applied to the green stand, it was found that 83% of the total loss has occurred in 12% of the stand which was originally placed in the high risk groups.

4. By volume, a reduction of the insect loss by removing high risk trees from the stand has averaged between 86% and 90% for the two years since application of the sanitation-salvage treatment.

PLANS FOR CONTINUING WORK DURING 1940

A completion of the loss inventory for the 1939 season will be made during the first portion of the 1940 field season. As a result of the loss cruise, additional data will be secured on the various phases of the program, the results of which will be summarized in the form of progress reports.

REFERENCE CITED

1. Bongberg, J. W. Loss Prevention Studies. Black's Mountain Experimental Forest. Season 1938.
Station Report. Berkeley, California
May 12, 1939

TABLE 1

INSECT LOSS - BLACK'S MOUNTAIN EXPERIMENTAL FOREST

BLOCK	EXPOSURE	TREE SPECIES	1937 LOSS TIMB.AREA (UNCUT)	1937 LOSS NO.OF TREES	1937 LOSS TOTAL VOLUME	1937 LOSS VOL. /A.	1938 LOSS TIMB.AREA (UNCUT)	1938 LOSS NO.OF TREES	1938 LOSS TOTAL VOLUME	1938 LOSS VOL. /A.	1939 (ESTIMATED) LOSS TIMB.AR. (UNCUT)	1939 (ESTIMATED) LOSS NO.OF TREES	1939 (ESTIMATED) LOSS TOTAL VOLUME	1939 (ESTIMATED) LOSS VOL. /A.
A	FLAT	PONDEROSA AND JEFFREY PINE		22	39,243	49		16	28,136	35		12	13,610	17
		WHITE FIR	800.6				800.6				800.6			
		INCENSE CEDAR												
B	SOUTH	PONDEROSA AND JEFFREY PINE		89	104,232	91		62	87,300	93		91	156,289	166
		WHITE FIR	1150.9	21	26,163	23	941.5	8	6,042	6	941.5	15	14,601	16
		INCENSE CEDAR						1	464					
C	NORTH & N.WEST	PONDEROSA AND JEFFREY PINE		84	122,292	52		104	140,079	60		262	383,213	163
		WHITE FIR	2351.0	59	59,630	25	2351.0	35	34,359	15	2351.0	5	6,235	3
		INCENSE CEDAR		1	318			2	126					
G	GENTLE S.WEST	PONDEROSA AND JEFFREY PINE		121	168,635	65		92	156,949	65		120	204,180	122
		WHITE FIR	2585.8	7	10,959	4	2413.0	6	9,713	4	1679.3	7	14,035	8
		INCENSE CEDAR												
P	SOUTH WEST	PONDEROSA AND JEFFREY PINE		128	174,629	87		117	143,830	72		252	366,622	183
		WHITE FIR	2003.4	56	42,256	21	2003.4	13	9,847	5	2003.4	4	1,135	
		INCENSE CEDAR						3	256					
TOTAL		PONDEROSA AND JEFFREY PINE		444	609,031	68		391	556,294	65		737	1123,914	145
		WHITE FIR	8891.7	143	139,008	16	8509.5	62	59,961	7	7775.8	31	36,006	46
		INCENSE CEDAR		1	318			6	3,155					